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SUBJECT: REVIEW OF THE 13 JANUARY 2014 GROUNDWATER QUALITY ASSESSMENT REPORT FOR THE EAST SAN JOAQUIN WATER QUALITY COALITION

On 13 January 2014, the California Regional Water Quality Control Board, Central Valley Region (Central Valley Water Board) received the East San Joaquin Water Quality Coalition (Coalition) Groundwater Quality Assessment Report (GAR). The GAR provides the foundational information necessary for design of the Management Practices Evaluation Program (MPEP), the Groundwater Quality Trend Monitoring Program, and the Groundwater Quality Management Plan. The GAR was reviewed to determine compliance with requirements pursuant to section VIII.D.1 of Waste Discharge Requirements General Order R5-2012-0116-R2 (Order), and section IV.A of Attachment B (Monitoring and Reporting Program) to the Order.

Overall, the Coalition's GAR demonstrates compliance with the terms and conditions of the Order, and meets most reporting requirements. The GAR comprehensively addresses the following objectives stated in the Order:

- Assesses available data and information to determine the high and low vulnerability areas where discharges from irrigated lands may result in groundwater quality degradation;
- Prioritizes high vulnerability areas for implementation of monitoring and studies;
- Provides a basis for establishing workplans to assess groundwater quality trends and to evaluate the effectiveness of agricultural management practices to protect groundwater quality; and
- Provides a basis for establishing groundwater quality management plans in high vulnerability areas and priorities for implementation of those plans.

Hydrogeologic High Vulnerability Areas (HHVAs) were developed by assessing the relative vulnerability of groundwater to irrigated land agricultural impacts in the Coalition area based on hydrogeologic sensitivity, overlying land uses and practices, and groundwater quality observations. This assessment was accomplished with a conceptual model utilizing a multiple linear regression analysis. Once the HHVAs were developed, the coalition mapped any areas with confirmed exceedances of the nitrate Maximum Contaminant Limit on the Valley Floor Area that were not already included in the HHVA (these additional areas are referred to as Tentative

High Vulnerability Areas). The combined HHVA and Tentative HVA comprise the final proposed East San Joaquin Water Quality Coalition High Vulnerability Area (ESJHVA).
Section 6 provides information on some other approaches that have been used in groundwater studies, as well as a discussion on why multiple linear regression was chosen. While Board staff or other readers of the GAR might have chosen other approaches, the outcome of the proposed HVAs seems reasonable, provided that some recommended changes are addressed. Additionally, the GAR will be updated every five years, providing opportunities to revisit the approach taken in the first GAR.

Table 1 provides descriptions of the required GAR components from the Order and MRP, and lists the section in the GAR that addresses each component. A brief description of how the GAR addressed each of these requirements, as well as the recommended revisions, if any, are provided below. The memorandum item numbers correspond to item numbers in Table 1. Some items are recommended to be addressed in this version of the GAR (2014), and other items are recommended to be addressed in the five-year update to the GAR.

Item 1. Land use and management practices information.

Section 4 of the GAR provides information on agricultural land use in the coalition region. Land use data from California Department of Water Resources (DWR) and United States Department of Agriculture (USDA) were used to develop three land use snapshots (mid-1990s, early 2000s, and 2012). The GAR identifies the top crop categories for 2012 (based on total acreage) as nut trees, grains/cotton, grasses, and grapes. These four categories represent the top 86 percent of agricultural commodities within the Central Valley Floor area of the Coalition region.

The GAR also contains a map of irrigation type based on data collected in the early 2000's by DWR, and considers more recent irrigation surveys collected by the coalition. The GAR evaluation concludes that there is likely a shift from flood irrigation to drip and micro sprinkler irrigation.

Finally, the GAR evaluated estimated fertilizer use compiled by United States Geological Survey (USGS), as well as typical ranges of applied nitrogen by crop category. The GAR concludes that the data show generally stable levels of fertilizer use in Merced, Madera and Stanislaus counties between the late 1980s through late 1990s with a trend towards increasing use during the early 2000s and peaking in 2004. Nitrogen fertilizer use appears to have decreased after 2004.

Staff generally concurs with the methods and conclusions generated for this component, although the USGS fertilizer use estimations only include data through 2006. Recommended revisions under item 1 are discussed next.

a. Turf farms are grouped under *Grasses* land use category with alfalfa, pasture, and clover (Table 4-1). Section 4.2.3 states that crops were grouped into 12 categories based in part on similarities in estimated typical nitrogen (N) application rates (pounds per acre per year). However, Rosenstock et al. 2013 estimates N applications to turf at 90-260 pounds, while alfalfa (20 pounds) and clover (11 pounds) have much lower application rates. It would be more appropriate to group turf farms with *Vegetables* or *Grains* due to similar N application rates. Because turf farms comprise a small percentage (less than 2%) of the Valley Floor area, this grouping change would not likely affect the final vulnerability designations. Staff is

therefore not recommending this change for the 2014 GAR. However, this change should be made in the five-year GAR update if still applicable.

b. A map(s) of agricultural land use in the Peripheral Area should be submitted with the trend monitoring workplan. Additionally, the information on the Peripheral Area should be included in the 2019 GAR, as the GAR should address the entire coalition area, including agricultural lands above the Valley Floor. Annual spatial crop data are available from the USDA NASS.

Item 2. Groundwater contour maps and flow directions.

Groundwater level contour maps were developed for the GAR using a hierarchical approach, starting with the most recent groundwater elevation data and using older data where needed to fill in spatial gaps. The information was interpolated across the region. The GAR Executive Summary provides a good summary of conclusions:

> "Contours of the calculated recent spring and fall groundwater elevations within the Central Valley Floor area show a steeper groundwater surface with greater hydraulic gradients in the eastern part of the Central Valley Floor area with the presence of some notable local groundwater depressions, particularly in the vicinity of Chowchilla, between Merced and Madera, and east of Turlock. The hydraulic gradient of the groundwater surface generally flattens to the west, particularly in the northern and western part of the Coalition region. Both spring and fall groundwater elevation contours indicate that groundwater generally flows in a southwestern direction away from the hills and mountains to the northeast."

The spatial resolution of the groundwater contour maps covers the entire coalition area, so it is a very generalized description. There are many areas on figures 3-16 and 3-17 that likely do not represent local conditions. Staff's recommendations are below.

a. Section 3.3.1.4 states that "[i]n an effort to represent more regional flow paths rather than more localized anomalies, the depth to groundwater raster and DEM raster were both smoothed prior to performing this calculation." Local flow conditions may differ significantly from regional flow paths and therefore more detailed analyses may be needed to address local studies that will be conducted for the trend monitoring workplan, the MPEP, or to address other data needs.

b. The MPEP Workplan should include maps and information on tile drains within the coalition region. Figure 3-8 is a map of tile drains based on DWR water quality sampling points, but none of the locations are within the coalition area. Section 3.2.3 states that "[t]ile drains apparently exist along the western edge of the coalition region, although specific locations for these features are not known." Irrigation districts and growers should be approached regarding maps of tile drainage properties. If irrigation districts and growers are approached and are not able to provide information, this effort should be documented.

Item 3. Identify recharge areas upgradient of communities where groundwater serves as a significant supply source.

Section 3 of the GAR identifies public water systems that are reliant on groundwater, if the public water system's boundaries were available in the California Department of Public Health (DPH) California Environmental Health Tracking Program's (CEHTP) Public Water Systems Boundary Tool. The GAR preparers then used GIS hydrology tools to estimate upgradient contributing recharge areas (GAR page 18).

The GAR provides information on recharge areas upgradient to a small portion of existing public water systems. The GAR does not address any small disadvantaged communities reliant on groundwater through domestic well use or small water systems. The current GAR should identify these communities on maps and should include these communities in the *High Priority Areas* where water quality is impacted (see Item 10 below). Below are some suggestions on how to address these issues to the extent feasible with the limited data that are available.

Public water systems

a. DPH's Drinking Water Source Assessment and Protection Program (DWSAP) provides a list of public water systems in California called *Completed Assessments and List of Sources*[1]. This 2004 list contains 531 public water systems in Madera, Merced, and Stanislaus counties, although some of these systems in Merced and Stanislaus counties are likely west of the San Joaquin River and thus not within the boundaries of this GAR. The CEHTP Public Water Systems Boundary Tool provides mapped boundaries for 25 of these 531 public water systems (these are the 25 systems that are mapped in the GAR)[2].

   The GAR preparers could attempt to map the 531 public water systems mentioned above (or the subset of those within the coalition boundary area) with a more manual electronic process (e.g., searching for the name of the entity/location online), and then run the GIS hydrology tools to estimate upgradient contributing recharge areas.

b. The GAR preparers could estimate upgradient contributing recharge areas to each square-mile section of land that contains a DPH well result. This would require identification/evaluation of local groundwater flow directions in the vicinity of the targeted DPH wells (see Item 2A above).

Domestic wells and small systems

There does not appear to be an existing source of data showing spatial distribution of domestic wells and small systems. However, it is likely that people living outside of public supply areas are using domestic wells or small systems.

c. The GAR should recognize that there are likely many thousands of people using domestic wells or small water systems within the coalition area. There may be estimates in reports from USGS, DPH, and/or the State Water Board that could be referenced.

d. The GAR could estimate the areas outside of public systems (by using the estimates from (a) or (b) above).

e. Staff recommends that the GAR should document attempts made to obtain domestic well data from the counties.

[1] At the time that this memo was prepared, this document was available online at http://www.cdph.ca.gov/certlic/drinkingwater/Pages/DWSAP.aspx

[2] DPH defines "public water system" as a system for the provision of water for human consumption through pipes or other constructed conveyances that has 15 or more service connections or regularly serves at least 25 individuals daily at least 60 days out of the year.

Item 4. Soil Survey.

Section 3.2 (Surface and Shallow Subsurface Sediments Characterization) of the GAR provides detailed information on shallow soil hydraulic conductivity, soil chemistry, and the Corcoran Clay, and staff concurs with the characterization of the area. The GAR identifies significant areas of high salinity, alkalinity and acidic soils. Refer to page ES-3 for a good summary of the findings and conclusions for this item.

It should be noted that the shallow soil hydraulic conductivity and vertical hydraulic conductivity information provided is not the same as the hydraulic conductivity of the underlying aquifer as measured through aquifer testing (e.g., pumping tests and slug tests). The GAR does not include information on this deeper hydraulic conductivity, which can vary vertically. If such information is readily available, it should be provided in any updates to the GAR.

Item 5. Groundwater Quality Data.

Section 5 of the GAR describes how the coalition acquired all readily available groundwater quality data as part of the GAR, including pesticide, total dissolved solids, and/or nitrate data from DPH, DWR, USGS, GAMA, Central Valley Water Board, DPR, Merced Irrigation District, and Turlock Irrigation District. Efforts to obtain data from additional local entities were not successful, due to confidentiality agreements and non-readily accessible electronic formatted data. Staff generally concurs with the data collected. Section ES 4.4 provides a good summary of this section.

Based on the Order requirement to analyze shallow groundwater constituent concentrations, the coalition attempted to group each water quality monitoring result as either “shallow” or “deep.” In many cases, detailed information on the well that would facilitate easy classification of depth category does not exist or is not available. This lack of information required the coalition to make some assumptions and interpretations in order to compile a shallow groundwater quality dataset.

Well Depth Categories

Section 5.1 (p.26) states that “…groundwater quality data were differentiated by interpreted depth category.” Wells with known depths of less than 200 feet were categorized as “shallow”, but the GAR does not include information on how this depth was determined to be an appropriate cutoff. Lockhart et al (2013) categorized wells within the GAR study area as shallow at 70 feet or less depth.

Section 5.1 (p. 26) states that “Deep wells included wells with depths greater than 200 feet and also municipal wells, irrigation wells, or other well uses…” This sentence seems to indicate that even if an irrigation well depth is known to be less than 200 feet, the well will still be categorized as deep. Water Board staff notes that irrigation wells, particularly older wells, may have multiple screened intervals or be gravel packed to the near surface or surface. Additionally, irrigation wells installed by cable tool drilling in areas with high hydraulic conductivity are often less than 200 feet in depth.

Section 3.2.2.2 states that the Corcoran Clay is “generally believed to divide deeper groundwater zones from shallow groundwater zones” and unconfined or semi-confined groundwater from confined groundwater. It also states that the Corcoran Clay depth and thickness varies across the coalition region, with the depth to the top of the clay ranging from

less than 50 feet to more than 300 feet. If shallow wells are defined as less than 200 feet in depth to interpret groundwater chemistry, flow directions, and vulnerability; then the results of these interpretations are a mixture of wells completed both above and below the Corcoran Clay.

a. At a minimum, wells with known depths should be categorized based on their depth rather than the well type in the future GAR updates.

b. The GAR update should provide an explanation as to how the 200 foot depth cutoff was selected, whether choosing such a cutoff resulted in categorizing wells both above and below the Corcoran Clay as shallow (or deep), and the sensitivity of the analysis to depth cutoff or methodology (e.g., selecting a shallower depth for cutoff or using above/below the Corcoran Clay to define shallow/deep wells). If it is more justified to use the Corcoran Clay layer as the general dividing line between shallow groundwater and deep groundwater, the next GAR update should reflect the change. Well depth categorizations would be refined depending on the depth to the Corcoran Clay at each well.

It should also be noted that section 5 of the GAR identifies geographic and temporal deficiencies in available groundwater quality data. The trend monitoring work plan, or another technical report, should specifically address these deficiencies with plans to fill the needed data gaps.

Item 6. Information on existing groundwater monitoring programs.

Section 7 of the GAR provides a good description of existing groundwater monitoring programs throughout the coalition region in order to "preliminarily assess the distribution of existing monitoring wells that may potentially be used for purposes of the Coalition's trend monitoring program." These include groundwater monitoring programs at DWR, DPR, DPH, State and Regional Water Boards, USGS, Merced Irrigation District, Turlock Irrigation District, Oakdale Irrigation District, and local groundwater management plans. The GAR concludes that "…the coverage of existing wells…appears to include wells located in the Priority 1 areas, other high vulnerability areas, and also low vulnerability areas. It appears that there is a large pool of existing, already monitored wells that can serve as potential candidate wells for the trend monitoring network." The trend monitoring workplan and the MPEP Workplan should:

a. Assess the possibility of data sharing between the data-collecting entity, the third-party, and the Central Valley Water Board for existing monitoring networks (or portions thereof) and/or relevant data sets.

b. Determine the merit and feasibility of incorporating existing groundwater data collection efforts, and their corresponding monitoring well systems for obtaining appropriate groundwater quality information to achieve the objectives of and support groundwater monitoring activities under the Order.

Item 7. Determine where known groundwater quality impacts exist for which irrigated agricultural operations are a potential contributor.

The GAR provides an extensive analysis of existing, readily available groundwater quality data and where conditions make groundwater more vulnerable to impacts from irrigated agricultural activities in sections 5 and 6. The GAR analyzes data for nitrate, TDS, and pesticides, and accurately and appropriately compares the results to water quality thresholds listed in SWRCB's

Water Quality Goals Online Database. Section ES 4.4 provides a good summary of this section, starting with a general conclusion that high concentrations of nitrate are found in shallow groundwater throughout much of the western part of the Central Valley Floor.

The maps for nitrate data focus on exceedances of the nitrate Maximum Contaminant Level (MCL) rather than groundwater quality impacts from nitrate, which would include concentrations above naturally occurring levels. Section 6.2.6.1 of the GAR indicates that the proposed East San Joaquin High Vulnerability Area (ESJHVA) captures 93 percent of wells with a most recent observed nitrate concentration at 5 mg/L or above.

a. The current GAR should include a map showing the locations of wells with observed nitrate concentrations between 5 and 10 mg/L in the Order area.

Item 8. Hydrogeologic information, GIS, graphics.

The GAR includes information on the geologic and hydrogeologic settings, sediments characterizations, soil chemistry, hydraulic conductivity, Corcoran Clay, depth to groundwater, groundwater flow directions, and recharge (some of which were previously mentioned in this memo). The coalition appropriately utilized GIS extensively in the GAR development, and there are numerous figures and tables included that are well done, clearly convey the information, and support the data analyses.

Item 9.a. Designate high vulnerability groundwater areas.

The GAR utilizes a multiple linear regression analysis based on the developed conceptual model to determine the East San Joaquin Water Quality Coalition High Vulnerability Area (ESJHVA). Section 6 provides information on some other approaches that have been used in other studies, as well as a discussion on why multiple linear regression was chosen for this effort. For the GAR, the statistical model was developed using observed groundwater quality, land use and hydrogeologic characteristics. Staff recommends the following changes or information be provided for the current GAR.

i. Section 6.2.6.2 of the GAR states "[o]f the total area of sections in which a pesticide exceedance has been reported, 96 percent of the total area of these sections falls within the ESJHVA." Since the location of wells monitored by the Department of Pesticide Regulation is given to the section resolution with the actual well location unknown, the ESJHVA should be extended to include the complete section where there has been a pesticide exceedance.

ii. Section 6.2.6.1 of the GAR indicates that the proposed ESJHVA captures 93 percent of wells with a most recent observed nitrate concentration between 5 and 10 mg/L. An explanation should be provided on why the ESJHVA does not include the additional seven percent of wells between 5 and 10 mg/L.

iii. The proposed ESJHVA includes a one-half mile buffer around the Hydrogeologic High Vulnerability Area (HHVA) to include an exceedance well when there is an exceedance well outside of the HHVA but near the HHVA. Section 6.2.5 of the GAR describes the "…gradational nature (transition from coarse to fine deposits) and intrinsic heterogeneity and discontinuity of the alluvial channel and fan deposits…" in the HHVAs, "…where the vulnerability might not be as well characterized by mapped shallow and surficial geologic materials alone. Areas with alluvial deposits from migrating channels and fans are less likely to have major continuous layers that would prevent or greatly impede the vertical movement

of a contaminant into the groundwater, even if the surficial soils and sediments suggest a lower vulnerability." These conclusions seem to suggest the buffer should be extended around the entire HHVA, or those portions of the HHVA that are known to have the aforementioned characteristics, regardless of proximity to an exceedance well. An explanation as to why the buffer was not extended in these areas should be added.

Item 9.b. Information used to designate HHVAs

The Coalition met the requirement to propose vulnerability designations by using a multiple linear regression model that considered physical properties (soil type, depth to groundwater, known agricultural impacts to beneficial uses, etc.) and management practices (irrigation method, crop type, nitrogen application and removal rates, etc.) to derive vulnerability scores. Higher vulnerability scores were classified as high vulnerability areas. In the selected modeling approach, only the most recent nitrate concentration for any given well was used to assemble the dependent variable data. Future revisions to the GAR should reconsider the use of only the most recent nitrate concentration, since seasonal or periodic changes in groundwater chemistry may occur and the most recent result may not be representative. While Board staff might have chosen other approaches, the outcome of the proposed HVAs seems reasonable, provided that recommended changes are made.

i. Table 6-4 gives results for each of the hydrogeologic variables (coefficient and associated p-value), but the results for the overlying land use control variables that were used in modeling are omitted. Because of the categorical nature and a large number of the land use variables, the results are important to assess how the models performed and those results should be provided in the revised GAR.

Item 9c. Rationale for proposed vulnerability designations.

The GAR provides good rationale for the proposed vulnerability designations. The rationale should be expanded as needed in the revised GAR due to recommended changes to items 9.a and 9.b above.

Item 10. Prioritize high vulnerability areas.

Section 6.3 describes how the High Vulnerability Areas were prioritized into three groups using a GIS statistical prioritization matrix and weighting factors. Please see figure ES-4 for the proposed prioritization outcome. The following changes should be made in the current GAR.

i. Small disadvantaged communities reliant on groundwater in high vulnerability areas should be identified as High Priority Areas. See Item 3 above.

ii. The GAR proposes a three-tier prioritization system of the ESJHVAs including *High, Moderate*, and *Low Priority Areas*. Staff recommends that the names be changed to *Priority 1 Area, Priority 2 Area, and Priority 3 Area* to avoid labeling some high vulnerability areas as *Low Priority*. All high vulnerability areas are a priority in the ILRP, and the label *Low Priority* for a High Vulnerability Area may lead to confusion.

iii. Prioritization of impacted wells in the Peripheral Area if there is irrigated agriculture in the vicinity that could impact the well should be proposed in the trend monitoring and MPEP workplans.

Item 11. Compliance with Sections 6735(a) and 7835 of the California Business and Professions Code.

Section 7835 of the California Business and Professions Code states that **"***All geologic plans, specifications, reports, or documents shall be prepared by a professional geologist or registered certified specialty geologist, or by a subordinate employee under his or her direction. In addition, they shall be signed by the professional geologist or registered certified specialty geologist or stamped with his or her seal, either of which shall indicate his or her responsibility for them*."

Section 6735(a) of the California Business and Professions Code states that *"All civil (including structural and geotechnical) engineering plans, calculations, specifications, and reports (hereinafter referred to as "documents") shall be prepared by, or under the responsible charge of, a licensed civil engineer and shall include his or her name and license number. Interim documents shall include a notation as to the intended purpose of the document, such as "preliminary," "not for construction," "for plan check only," or "for review only." All civil engineering plans and specifications that are permitted or that are to be released for construction shall bear the signature and seal or stamp of the licensee and the date of signing and sealing or stamping. All final civil engineering calculations and reports shall bear the signature and seal or stamp of the licensee, and the date of signing and sealing or stamping. If civil engineering plans are required to be signed and sealed or stamped and have multiple sheets, the signature, seal or stamp, and date of signing and sealing or stamping shall appear on each sheet of the plans. If civil engineering specifications, calculations, and reports are required to be signed and sealed or stamped and have multiple pages, the signature, seal or stamp, and date of signing and sealing or stamping shall appear at a minimum on the title sheet, cover sheet, or signature sheet."*

Although not specified as a requirement in the Order, the GAR contains information that is consistent with the requirement of the aforementioned sections of the California Business and Professions Code, and, therefore, the appropriate signature or stamp should be included.

Table 1. Components of the Groundwater Assessment Report (modified Table 1-1 in GAR)

Item No.	Required Components	Location in GAR
GAR Components – MRP section IV.A.2 through IV.A.5		
Information used to develop model and High Vulnerability Areas		
1	Detailed land use information with emphasis on land uses associated with irrigated agricultural operations. The information shall identify the largest acreage commodity types in the third-party area, including the most prevalent commodities comprising up to at least 80% of the irrigated agricultural acreage in the third-party area.	Section 4
2	Information regarding depth to groundwater, provided as a contour map(s).	Section 3
3	Groundwater recharge information, including identification of areas contributing recharge to urban and rural communities where groundwater serves as a significant source of supply.	Section 3
4	Soil survey information, including significant areas of high salinity, alkalinity and acidity.	Section 3
5	Shallow groundwater constituent concentrations (potential constituents of concern include any material applied as part of the agricultural operation, including constituents in irrigation supply water [e.g., pesticides, fertilizers, soil amendments, etc.] that could impact beneficial uses or cause degradation).	Section 5 and 6
6	Information on existing groundwater data collection and analysis efforts relevant to the Order (e.g., Department of Pesticide Regulation [DPR] United States Geological Survey [USGS] State Water Board Groundwater Ambient Monitoring and Assessment [GAMA], California Department of Public Health, local groundwater management plans, etc.). This groundwater data compilation and review shall include readily accessible information relative to the Order on existing monitoring well networks, individual well details, and monitored parameters. For existing monitoring networks (or portions thereof) and/or relevant data sets, the third-party should assess the possibility of data sharing between the data-collecting entity, the third- party, and the Central Valley Water Board. Determine the merit and feasibility of incorporating existing groundwater data collection efforts, and their corresponding monitoring well systems for obtaining appropriate groundwater quality information to achieve the objectives of and support groundwater monitoring activities under the Order. This shall include specific findings and conclusions and provide the rationale for conclusions.	Section 7
7	Determine where known groundwater quality impacts exist for which irrigated agricultural operations are a potential contributor or where conditions make groundwater more vulnerable to impacts from irrigated agricultural activities.	Section 5 and 6

Item No.	Required Components	Location in GAR
8	The GAR shall discuss pertinent geologic and hydrogeologic information for the third-party area(s) and utilize GIS mapping applications, graphics, and tables, as appropriate, in order to clearly convey pertinent data, support data analysis, and show results.	Section 3
High Vulnerability Groundwater Areas Designation		
9.a	Designate high/low vulnerability areas for groundwater in consideration of high and low vulnerability definitions provided in Attachment E to the Order.	Section 6
9.b	The vulnerability designations will be made by the third-party using a combination of physical properties (soil type, depth to groundwater, known agricultural impacts to beneficial uses, etc.) and management practices (irrigation method, crop type, nitrogen application and removal rates, etc.).	Section 6
9.c	The third-party shall provide the rationale for proposed vulnerability determinations.	Section 6
Prioritization of High Vulnerability Groundwater Areas		
10	Prepare a ranking/prioritization of high vulnerability areas to provide a basis for prioritization of workplan activities.	Section 6
Other		
11	Section 7835 of the California Geologist and Geophysicist Act states that **"**All geologic plans, specifications, reports, or documents shall be prepared by a professional geologist or registered certified specialty geologist, or by a subordinate employee under his or her direction. In addition, they shall be signed by the professional geologist or registered certified specialty geologist or stamped with his or her seal, either of which shall indicate his or her responsibility for them."	Not included
GAR Objectives - Order R5-2012-0116-R2, section VIII.D.1 and Attachment B (MRP) section IV.A.1		
12	Provide an assessment of all available, applicable and relevant data and information to determine the high and low vulnerability areas where discharges from irrigated lands may result in groundwater quality degradation.	throughout
13	Establish priorities for implementation of monitoring and studies within high vulnerability areas.	Section 6
14	Provide a basis for establishing workplans to assess groundwater quality trends.	throughout
15	Provide a basis for establishing workplans and priorities to evaluate the effectiveness of agricultural management practices to protect groundwater quality.	throughout
16	Provide a basis for establishing groundwater quality management plans in high vulnerability areas and priorities for implementation of those plans.	throughout